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Glossary

305(b)	Refers to section 305 subsection "b" of the Clean Water Act. 305(b) generally describes a report of each state's water quality, and is the principle means by which the U.S. Environmental Protection Agency, Congress, and the public evaluate whether U.S. waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of the remaining problems.
§303(d)	Refers to section 303 subsection "d" of the Clean Water Act. Section 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to U.S. Environmental Protection Agency approval.
Acre-Foot	A volume of water that would cover an acre to a depth of one foot. Often used to quantify reservoir storage and the annual discharge of large rivers.
Adsorption	The adhesion of one substance to the surface of another. Clays, for example, can adsorb phosphorus and organic molecules
Aeration	A process by which water becomes charged with air directly from the atmosphere. Dissolved gases, such as oxygen, are then available for reactions in water.
Aerobic	Describeas life, processes, or conditions that require the presence of oxygen.
Assessment Database (ADB)	The ADB is a relational database application designed for the U.S. Environmental Protection Agency for tracking water quality assessment data, such as use attainment and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of water bodies, and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.
Adfluvial	Describes fish whose life history involves seasonal migration from lakes to streams for spawning.
Adjunct	In the context of water quality, adjunct refers to areas directly adjacent to focal or refuge habitats that have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native species.

Alevin	A newly hatched, incompletely developed fish (usually a salmonid) still in nest or inactive on the bottom of a water body, living off stored yolk.
Algae	Non-vascular (without water-conducting tissue) aquatic plants that occur as single cells, colonies, or filaments.
Alluvium	Unconsolidated recent stream deposition.
Ambient	General conditions in the environment. In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations, or specific disturbances such as a wastewater outfall (Armantrout 1998, EPA 1996).
Anadromous	Fish, such as salmon and sea-run trout, that live part or the majority of their lives in the salt water but return to fresh water to spawn.
Anaerobic	Describes the processes that occur in the absence of molecular oxygen and describes the condition of water that is devoid of molecular oxygen.
Anoxia	The condition of oxygen absence or deficiency.
Anthropogenic	Relating to, or resulting from, the influence of human beings on nature.
Anti-Degradation	Refers to the U.S. Environmental Protection Agency's interpretation of the Clean Water Act goal that states and tribes maintain, as well as restore, water quality. This applies to waters that meet or are of higher water quality than required by state standards. State rules provide that the quality of those high quality waters may be lowered only to allow important social or economic development and only after adequate public participation (IDAPA 58.01.02.051). In all cases, the existing beneficial uses must be maintained. State rules further define lowered water quality to be 1) a measurable change, 2) a change adverse to a use, and 3) a change in a pollutant relevant to the water's uses (IDAPA 58.01.02.003.56).
Aquatic	Occurring, growing, or living in water.
Aquifer	An underground, water-bearing layer or stratum of permeable rock, sand, or gravel capable of yielding of water to wells or springs.
Assemblage (aquatic)	An association of interacting populations of organisms in a given water body; for example, a fish assemblage, or a benthic macroinvertebrate assemblage (also see Community) (EPA 1996).
Assimilative Capacity	The ability to process or dissipate pollutants without ill effect to beneficial uses.
Autotrophic	An organism is considered autotrophic if it uses carbon dioxide as its main source of carbon. This most commonly happens through photosynthesis.

Batholith	A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.
Bedload	Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.
Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic biota, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers
Benthic	Pertaining to or living on or in the bottom sediments of a water body
Benthic Organic Matter.	The organic matter on the bottom of a water body.
Benthos	Organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the lake and stream bottoms.
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.
Best Professional Judgment	A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.
Biochemical Oxygen Demand (BOD)	The amount of dissolved oxygen used by organisms during the decomposition (respiration) of organic matter, expressed as mass of oxygen per volume of water, over some specified period of time.
Biological Integrity	1) The condition of an aquatic community inhabiting unimpaired water bodies of a specified habitat as measured by an evaluation of multiple attributes of the aquatic biota (EPA 1996). 2) The ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the natural habitats of a region (Karr 1991).
Biomass	The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.
Biota	The animal and plant life of a given region.
Biotic	A term applied to the living components of an area.

Clean Water Act (CWA)	The Federal Water Pollution Control Act (commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987, establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.
Coliform Bacteria	A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria).
Colluvium	Material transported to a site by gravity.
Community	A group of interacting organisms living together in a given place.
Conductivity	The ability of an aqueous solution to carry electric current, expressed in micro (μ) mhos/cm at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.
Cretaceous	The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago.
Criteria	In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. The U.S. Environmental Protection Agency develops criteria guidance; states establish criteria.
Cubic Feet per Second	A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.
Cultural Eutrophication	The process of eutrophication that has been accelerated by human-caused influences. Usually seen as an increase in nutrient loading (also see Eutrophication).
Culturally Induced Erosion	Erosion caused by increased runoff or wind action due to the work of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).
Debris Torrent	The sudden down slope movement of soil, rock, and vegetation on steep slopes, often caused by saturation from heavy rains.

Decomposition	The breakdown of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and nonbiological processes.
Depth Fines	Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 mm depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 cm).
Designated Uses	Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.
Discharge	The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).
Dissolved Oxygen (DO)	The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.
Disturbance	Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.
E. coli	Short for *Escherichia Coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans. Their presence is often indicative of fecal contamination.
Ecology	The scientific study of relationships between organisms and their environment; also defined as the study of the structure and function of nature.
Ecological Indicator	A characteristic of an ecosystem that is related to, or derived from, a measure of a biotic or abiotic variable that can provide quantitative information on ecological structure and function. An indicator can contribute to a measure of integrity and sustainability. Ecological indicators are often used within the multimetric index framework.
Ecological Integrity	The condition of an unimpaired ecosystem as measured by combined chemical, physical (including habitat), and biological attributes (EPA 1996).
Ecosystem	The interacting system of a biological community and its non-living (abiotic) environmental surroundings.
Effluent	A discharge of untreated, partially treated, or treated wastewater into a receiving water body.
Endangered Species	Animals, birds, fish, plants, or other living organisms threatened with imminent extinction. Requirements for declaring a species as endangered are contained in the Endangered Species Act.

Environment	The complete range of external conditions, physical and biological, that affect a particular organism or community.
Eocene	An epoch of the early Tertiary period, after the Paleocene and before the Oligocene.
Eolian	Windblown, referring to the process of erosion, transport, and deposition of material by the wind.
Ephemeral Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table. (American Geologic Institute 1962).
Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Eutrophic	From Greek for "well nourished," this describes a highly productive body of water in which nutrients do not limit algal growth. It is typified by high algal densities and low clarity.
Eutrophication	1) Natural process of maturing (aging) in a body of water. 2) The natural and human-influenced process of enrichment with nutrients, especially nitrogen and phosphorus, leading to an increased production of organic matter.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Existing Beneficial Use or Existing Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).
Exotic Species	A species that is not native (indigenous) to a region.
Extrapolation	Estimation of unknown values by extending or projecting from known values.
Fauna	Animal life, especially the animals characteristic of a region, period, or special environment.
Fecal Coliform Bacteria	Bacteria found in the intestinal tracts of all warm-blooded animals or mammals. Their presence in water is an indicator of pollution and possible contamination by pathogens (also see Coliform Bacteria).
Fecal Streptococci	A species of spherical bacteria including pathogenic strains found in the intestines of warm-blooded animals.
Feedback Loop	In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.
Fixed-Location Monitoring	Sampling or measuring environmental conditions continuously or repeatedly at the same location.
Flow	See Discharge.

Fluvial	In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.
Focal	Critical areas supporting a mosaic of high quality habitats that sustain a diverse or unusually productive complement of native species.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions (EPA 1997).
Fully Supporting but Threatened	An intermediate assessment category describing water bodies that fully support beneficial uses, but have a declining trend in water quality conditions, which if not addressed, will lead to a "not fully supporting" status.
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.
Grab Sample	A single sample collected at a particular time and place. It may represent the composition of the water in that water column.
Gradient	The slope of the land, water, or streambed surface.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Growth Rate	A measure of how quickly something living will develop and grow, such as the amount of new plant or animal tissue produced per a given unit of time, or number of individuals added to a population.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

Hydrologic Cycle	The cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Atmospheric moisture, clouds, rainfall, runoff, surface water, ground water, and water infiltrated in soils are all part of the hydrologic cycle.
Hydrologic Unit	One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and subwatersheds, respectively.
Hydrologic Unit Code (HUC)	The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.
Hydrology	The science dealing with the properties, distribution, and circulation of water.
Impervious	Describes a surface, such as pavement, that water cannot penetrate.
Influent	A tributary stream.
Inorganic	Materials not derived from biological sources.
Instantaneous	A condition or measurement at a moment (instant) in time.
Intergravel Dissolved Oxygen	The concentration of dissolved oxygen within spawning gravel. Consideration for determining spawning gravel includes species, water depth, velocity, and substrate.
Intermittent Stream	1) A stream that flows only part of the year, such as when the ground water table is high or when the stream receives water from springs or from surface sources such as melting snow in mountainous areas. The stream ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. 2) A stream that has a period of zero flow for at least one week during most years.
Interstate Waters	Waters that flow across or form part of state or international boundaries, including boundaries with Indian nations.
Irrigation Return Flow	Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.

Key Watershed	A watershed that has been designated in Idaho Governor Batt's *State of Idaho Bull Trout Conservation Plan* (1996) as critical to the long-term persistence of regionally important trout populations.
Knickpoint	Any interruption or break of slope.
Land Application	A process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of treatment, pollutant removal, or ground water recharge.
Limiting Factor	A chemical or physical condition that determines the growth potential of an organism. This can result in a complete inhibition of growth, but typically results in less than maximum growth rates.
Limnology	The scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.
Load Allocation (LA)	A portion of a water body's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).
Load(ing)	The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.
Loading Capacity (LC)	A determination of how much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.
Loam	Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.
Loess	A uniform wind-blown deposit of silty material. Silty soils are among the most highly erodible.
Lotic	An aquatic system with flowing water such as a brook, stream, or river where the net flow of water is from the headwaters to the mouth.
Luxury Consumption	A phenomenon in which sufficient nutrients are available in either the sediments or the water column of a water body, such that aquatic plants take up and store an abundance in excess of the plants' current needs.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.
Macrophytes	Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (*Ceratophyllum sp.*), are free-floating forms not rooted in sediment.

Margin of Safety (MOS)	An implicit or explicit portion of a water body's loading capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.
Mass Wasting	A general term for the down slope movement of soil and rock material under the direct influence of gravity.
Mean	Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.
Median	The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; and 6 is the median of 1, 2, 5, 7, 9, 11.
Metric	1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.
Milligrams per Liter (mg/L)	A unit of measure for concentration in water, essentially equivalent to parts per million (ppm).
Million Gallons per Day (MGD)	A unit of measure for the rate of discharge of water, often used to measure flow at wastewater treatment plants. One MGD is equal to 1.547 cubic feet per second.
Miocene	Of, relating to, or being an epoch of, the Tertiary between the Pliocene and the Oligocene periods, or the corresponding system of rocks.
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a water body.
Mouth	The location where flowing water enters into a larger water body.
National Pollution Discharge Elimination System (NPDES)	A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.
Natural Condition	A condition indistinguishable from that without human-caused disruptions.
Nitrogen	An element essential to plant growth, and thus is considered a nutrient.
Nodal	Areas that are separated from focal and adjunct habitats, but serve critical life history functions for individual native fish.

Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing water bodies that have been studied, but are missing critical information needed to complete an assessment.
Not Attainable	A concept and an assessment category describing water bodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).
Not Fully Supporting Cold Water	At least one biological assemblage has been significantly modified beyond the natural range of its reference condition (EPA 1997).
Nuisance	Anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.
Nutrient	Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.
Nutrient Cycling	The flow of nutrients from one component of an ecosystem to another, as when macrophytes die and release nutrients that become available to algae (organic to inorganic phase and return).
Oligotrophic	The Greek term for "poorly nourished." This describes a body of water in which productivity is low and nutrients are limiting to algal growth, as typified by low algal density and high clarity.
Organic Matter	Compounds manufactured by plants and animals that contain principally carbon.
Orthophosphate	A form of soluble inorganic phosphorus most readily used for algal growth.
Oxygen-Demanding Materials	Those materials, mainly organic matter, in a water body that consume oxygen during decomposition.

Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.
Partitioning	The sharing of limited resources by different races or species; use of different parts of the habitat, or the same habitat at different times. Also the separation of a chemical into two or more phases, such as partitioning of phosphorus between the water column and sediment.
Pathogens	Disease-producing organisms (e.g., bacteria, viruses, parasites).
Perennial Stream	A stream that flows year-around in most years.
Periphyton	Attached microflora (algae and diatoms) growing on the bottom of a water body or on submerged substrates, including larger plants.
Pesticide	Substances or mixtures of substances intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.
pH	The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.
Phased TMDL	A total maximum daily load (TMDL) that identifies interim load allocations and details further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a water body. Under a phased TMDL, a refinement of load allocations, wasteload allocations, and the margin of safety is planned at the outset.
Phosphorus	An element essential to plant growth, often in limited supply, and thus considered a nutrient.
Physiochemical	In the context of bioassessment, the term is commonly used to mean the physical and chemical factors of the water column that relate to aquatic biota. Examples in bioassessment usage include saturation of dissolved gases, temperature, pH, conductivity, dissolved or suspended solids, forms of nitrogen, and phosphorus. This term is used interchangeable with the terms "physical/chemical" and "physicochemical."
Plankton	Microscopic algae (phytoplankton) and animals (zooplankton) that float freely in open water of lakes and oceans.

Point Source	A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable "point" of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.
Pollution	A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.
Population	A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.
Pretreatment	The reduction in the amount of pollutants, elimination of certain pollutants, or alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, discharging or otherwise introducing such wastewater into a publicly owned wastewater treatment plant.
Primary Productivity	The rate at which algae and macrophytes fix carbon dioxide using light energy. Commonly measured as milligrams of carbon per square meter per hour.
Protocol	A series of formal steps for conducting a test or survey.
Qualitative	Descriptive of kind, type, or direction.
Quality Assurance (QA)	A program organized and designed to provide accurate and precise results. Included are the selection of proper technical methods, tests, or laboratory procedures; sample collection and preservation; the selection of limits; data evaluation; quality control; and personnel qualifications and training. The goal of QA is to assure the data provided are of the quality needed and claimed (Rand 1995, EPA 1996).
Quality Control (QC)	Routine application of specific actions required to provide information for the quality assurance program. Included are standardization, calibration, and replicate samples. QC is implemented at the field or bench level (Rand 1995, EPA 1996).
Quantitative	Descriptive of size, magnitude, or degree.
Reach	A stream section with fairly homogenous physical characteristics.
Reconnaissance	An exploratory or preliminary survey of an area.
Reference	A physical or chemical quantity whose value is known, and thus is used to calibrate or standardize instruments.

Reference Condition	1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).
Reference Site	A specific locality on a water body that is minimally impaired and is representative of reference conditions for similar water bodies.
Representative Sample	A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.
Resident	A term that describes fish that do not migrate.
Respiration	A process by which organic matter is oxidized by organisms, including plants, animals, and bacteria. The process converts organic matter to energy, carbon dioxide, water, and lesser constituents.
Riffle	A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.
Riparian	Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a water body.
Riparian Habitat Conservation Area (RHCA)	A U.S. Forest Service description of land within the following number of feet up-slope of each of the banks of streams: - 300 feet from perennial fish-bearing streams - 150 feet from perennial non-fish-bearing streams - 100 feet from intermittent streams, wetlands, and ponds in priority watersheds.
River	A large, natural, or human-modified stream that flows in a defined course or channel, or a series of diverging and converging channels.
Runoff	The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.
Sediments	Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.
Settleable Solids	The volume of material that settles out of one liter of water in one hour.

Species	1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.
Spring	Ground water seeping out of the earth where the water table intersects the ground surface.
Stagnation	The absence of mixing in a water body.
Stenothermal	Unable to tolerate a wide temperature range.
Stratification	A Department of Environmental Quality classification method used to characterize comparable units (also called classes or strata).
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Storm Water Runoff	Rainfall that quickly runs off the land after a storm. In developed watersheds the water flows off roofs and pavement into storm drains that may feed quickly and directly into the stream. The water often carries pollutants picked up from these surfaces.
Stressors	Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4^{th} field hydrologic units (also see Hydrologic Unit).
SBA (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Subwatershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6^{th} field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 mm depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.

Surface Runoff	Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.
Surface Water	All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.
Suspended Sediments	Fine material (usually sand size or smaller) that remains suspended by turbulence in the water column until deposited in areas of weaker current. These sediments cause turbidity and, when deposited, reduce living space within streambed gravels and can cover fish eggs or alevins.
Taxon	Any formal taxonomic unit or category of organisms (e.g., species, genus, family, order). The plural of taxon is taxa (Armantrout 1998).
Tertiary	An interval of geologic time lasting from 66.4 to 1.6 million years ago. It constitutes the first of two periods of the Cenozoic Era, the second being the Quaternary. The Tertiary has five subdivisions, which from oldest to youngest are the Paleocene, Eocene, Oligocene, Miocene, and Pliocene epochs.
Thalweg	The center of a stream's current, where most of the water flows.
Threatened Species	Species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Total Maximum Daily Load (TMDL)	A TMDL is a water body's loading capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual bases. TMDL = Loading Capacity = Load Allocation + Wasteload Allocation + Margin of Safety. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.
Total Dissolved Solids	Dry weight of all material in solution in a water sample as determined by evaporating and drying filtrate.

Total Suspended Solids (TSS)	The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Greenborg, Clescevi, and Eaton 1992) call for using a filter of 2.0 micron or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.
Toxic Pollutants	Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.
Tributary	A stream feeding into a larger stream or lake.
Trophic State	The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.
Total Dissolved Solids	Dry weight of all material in solution in a water sample as determined by evaporating and drying filtrate.
Total Suspended Solids (TSS)	The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Greenborg, Clescevi, and Eaton 1995) call for using a filter of 2.0 micron or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.
Toxic Pollutants	Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.
Tributary	A stream feeding into a larger stream or lake.
Trophic State	The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.
Turbidity	A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.
Vadose Zone	The unsaturated region from the soil surface to the ground water table.
Wasteload Allocation (WLA)	The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Quality	A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.
Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.
Water Quality Limited	A label that describes water bodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a §303(d) list.
Water Quality Limited Segment (WQLS)	Any segment placed on a state's §303(d) list for failure to meet applicable water quality standards, and/or is not expected to meet applicable water quality standards in the period prior to the next list. These segments are also referred to as "§303(d) listed."
Water Quality Management Plan	A state or area-wide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.
Water Quality Modeling	The prediction of the response of some characteristics of lake or stream water based on mathematical relations of input variables such as climate, stream flow, and inflow water quality.
Water Quality Standards	State-adopted and U.S. Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.
Water Table	The upper surface of ground water; below this point, the soil is saturated with water.

Watershed	1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "subwatersheds." 2) The whole geographic region which contributes water to a point of interest in a water body.
Water Body Identification Number (WBID)	A number that uniquely identifies a water body in Idaho and ties in to the Idaho Water Quality Standards and GIS information.
Wetland	An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.
Young of the Year	Young fish born the year captured, evidence of spawning activity.

Appendix A. Unit Conversion Chart

Table A-1. Metric - English unit conversions.

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (gal) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 gal = 3.78 L 1 L= 0.26 gal 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 gal = 11.35 L 3 L = 0.79 gal 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (cfs)[1]	Cubic Meters per Second (m^3/sec)	1 cfs = 0.03 m^3/sec 1 m^3/sec = 35.31cfs	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 lb
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 °C = 37.4 °F

[1]1 cfs = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 cfs.

[2]The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water.

Appendix B. Geology of the Goose Creek Subbasin

GEOLOGY OF THE GOOSE CREEK BASIN

By

Carl F. Austin, Ph.D.

This short summary of the geology of the Goose Creek basin is based on published reports by Bowen (1911), Butler et al. (1920), Piper (1923), Anderson (1931), Youngquist and Haegele (1956), Mapel and Hail (1959), and an unpublished thesis by Hildebrand (1984) plus field work by the author and unpublished photogeologic studies by W.H. Austin Jr.

The Goose Creek drainage basin consists of approximately 1200 square miles and includes considerable area below the Oakley Reservoir. This geologic summary is restricted to the area from Goose Creek Reservoir south, the area popularly known as the Goose Creek Basin. It should be noted that the geology of the basin is not well established and little has been published on the parts of the basin in Utah and Nevada. Approximately 105 square miles of the basin is in Box Elder County, Utah and 320 square miles in Elko County, Nevada. Some 12 square miles of the basin are in Twin Falls County, Idaho, and the remainder in Cassia County, Idaho.

The basin consists of the east side and south end of the heavily faulted anticline that makes up the Cassia Mountains, locally known as the South Hills, is bounded on the south by fault block mountains and stacked thrust sheets and is bordered on the east by the stacked thrust sheets of what in the literature is called South Mountain. The ages of the rocks making up the basin perimeter range from pre-Cambrian through Paleozoic with the lower parts of the basin margins and the bulk of the basin floor being mostly Miocene volcanics with interbedded sediments. The area exhibits extensive folding ranging from the very large anticline of the South Hills to small local folds in the volcanics. The area has undergone extensive and complex faulting. Indeed, long straight-line creeks such as Hardesty Creek clearly are fault controlled and hot springs traces in some fields clearly mark conjugate shear sets.

Goose Creek itself flows across what are at present believed to late Miocene volcanics and sediments. In contrast Cold Creek starts in a granodiorite intrusive, flows mostly across pre-Cambrian Harrison series metamorphics, and then across a short stretch of Miocene volcanics to enter Goose Creek. In total contrast, Jay Creek and almost all of Trout Creek flow across Paleozoic marine sediments consisting of limestone, quartzite, and some shale believed to be phosphatic. Both Beaverdam and Trapper Creeks flow almost exclusively across volcanics and their intercalated sediments.

The thick volcanic sequence of the basin, possibly an equivalent to the Miocene Idavada, consists of over 3000 feet of rhyolitic vitric ash fall and ash flow tuffs with interbedded pebble conglomerates, sandstones, siltstones, carbonaceous shales, lignite coal beds, diatomite and marl.

Goose Creek drains a number of mineral deposits. A wide band of mineralization extends along the east side of the basin from Cold Creek to Little Birch Creek. The largest and most heavily exploited deposits are the silver-gold deposits of Vipont, which went into production in 189l and had sporadic activity up through the 1980's. This mining district drains into Goose Creek via Little Birch Creek. This same zone of mineralization embraces an epithermal hotsprings type gold deposit in upper Blue Hill Creek and also a similar deposit in upper Cold Creek. Both deposits have seen exploration drilling in the past few years and are actively under claim. Other deposits are the lignite coal beds, which have had considerable production from the early 1900's to World War II. These beds are widely marked by brilliant red-orange burned outcrops. The basin has undeveloped uranium ores both as roll front type and dispersals in the lignites. There are undeveloped diatomite beds, bentonite beds and extensive zeolite deposits. Building stone has been long produced, with the thin quartzites of Oakley having a worldwide reputation for fine quality. Some of the quartzites are mined in the upper Cold Creek drainage. There are widespread perlites in the basin but none have been produced, nor have any of the rather pure illite beds been produced.

The Goose Creek basin is a pressurized hot water system, with surface flows today from old wildcat oil wells and as leakage along fault zones. A major hot springs silica mound is present at Niles Spring which attests to the fact that there is a geothermal potential in the south-central part of the basin, separate from that of the South Hills Anticline.

Oil and gas drilling dates back to the 1920's but the wells produce only hot water plus a small amount of what is presumed to be coal bed methane.

The margins of the basin have undergone very extensive rather recent mountain type glaciation. Creeks such as Cold Creek, Emery Creek, and especially Blue Hill Creek have excellent morrainal features. Because of traces of wave cut terraces, it is probable that the rather extensive flat meadows of the basin represent lake-bed tills. These are now being somewhat dissected as Goose Creek attempts to recover from the dramatic climate changes of the last few hundred years.

The trace element chemistry of each creek should reflect the rocks across which it flows, and the springs and seeps feeding these often intermittent streams will be strongly affected by their host rock types and by the amount of geothermal fluid leaking locally.

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Appendix C. Distribution List

Amy Luft. Idaho Department of Environmental Quality. Technical Editor. 10/02/2003.

Marti Bridges. Idaho Department of Environmental Quality. TMDL Program Manager. 10/02/2003.

Balthasar Buhidar. Idaho Department of Environmental Quality. Regional Manager. 10/02/2003.

Mike Etcheverry. Idaho Department of Environmental Quality. Implementation specialist. 10/02/2003.

Jennifer Claire. Idaho Department of Environmental Quality. TMDL Writer. 10/02/2003.

Sean Woodhead. Idaho Department of Environmental Quality. BURP Coordinator. Idaho Department of Environmental Quality. 10/02/2003.

Richard Garrard. University of Idaho. Cassia County Extension. Burley Idaho. 10/14/2003.

Scott Nannega. United States Forest Service. Sawtooth National Forest–Burley Ranger District. 3650 South Overland Ave. Burley, ID 83318. 11/12/2003.

Valdon Hancock. United States Forest Service. Sawtooth National Forest–Supervisor's Office. 2647 Kimberly Rd E. Twin Falls, ID 83301. 11/12/2003.

Trudy Flock. United States Forest Service. Sawtooth National Forest–Burley Ranger District. 3650 South Overland Ave. Burley, ID 83318. 11/12/2003.

Miriam Austin. Western Watersheds. P.O. Box 1770, Hailey ID, 83333. 11/12/2003.

Alicia Lane. Bureau of Reclamation–Burley Field Office. 1359 E Hansen Ave. Burley, ID 83318. 11/12/2003.

Steve Davis. Bureau of Land Management–Burley District Office. 15 E 200 S, Burley, ID 83318. 11/12/2003.

Elena Shaw. Bureau of Land Management–Burley District Office. 15 E 200 S, Burley, ID 83318. 11/12/2003.

Steve Schuyler. Natural Resources Conservation Service–Twin Falls Field Office. 1441 Fillmore St. Ste. A, Twin Falls, ID 83301. 11/12/2003.

Carolyn Firth. Soil Conservation District–Burley Field Office. 1361 E 16th St. Burley, ID 83318. 11/12/2003.

Mark Dallon. Soil Conservation District–Twin Falls Field Office. 1441 Fillmore St. Ste. A, Twin Falls, ID 83301. 11/12/2003.

Mike Combs. Natural Resources Conservation Service–Burley Field Office. 1361 E 16th St. Burley, ID 83318. 11/12/2003.

Katie Fite. Committee for Idaho's High Desert. P.O. Box 2863, Boise, ID 83701. 11/12/2003.

Bill Sedivy. Idaho Rivers United. P.O. Box 633, Boise, ID 83701. 11/12/2003.

Chuck Pentzer. Idaho Soil Conservation Commission. 20 W. 100 S. Jerome, ID 83338. 11/12/2003.

Appendix D. Public Comments

The 30-day public comment period closed on December 12, 2003 at 5:00 p.m. During that period comments were received from the US BLM and the US Forest Service. Several of the US BLM and US Forest Service comments were editorial in nature and those changes were incorporated into the document. An electronic copy of the US BLM technical comments was provided and is included here. DEQ's responses follow in italics.

BLM BURLEY FIELD OFFICE COMMENTS CONCERNING THE DRAFT FOR THE "GOOSE CREEK SUBBASIN ASSESSMENT AND TOTAL MAXIMUM DAILY LOADS"

In reference to temperature TMDL's, shade components, solar load and reference streams on pages XX, 49, 180 and 184:

DEQ should strive to locate streams with the same potential vegetation and channel characteristics when determining how much shade any particular stream can achieve. While many of the smaller streams such as Cold Creek may fit into DEQ's formula, it does not appear that any of the reference streams are similar to much of lower Goose Creek with regards to potential natural vegetation and potential shading. The 42% shade determined by averaging shade on fully supported streams will likely never be reached on a stream like Goose Creek. This stream is simply too wide to allow willow or other potential natural vegetation to provide a high level of shade in the lower portions of the stream. Small, rocky systems have segments along them with the potential for nearly 100% shading in contrast to wide meandering streams with fine substrate, such as the meadows along lower Goose Creek, which do not have such potential. In essence, it appears that the formula may underestimate potential shade along some streams and overestimate potential in others. Due to this variability in potential, it is unlikely that these streams all have the same potential solar load as indicated in Table 31 on page 184. In reference to the review of temperature criteria stated on page 49, BLM strongly encourages DEQ to consider not only outdated understanding of cold water aquatic life's temperature requirements but also the likelihood that statewide temperature standards violations are due not only to geothermal springs but to a variety of reasons including regional climates, drought, flow regimes, and the variability in potential natural vegetation communities and stream types.

It is DEQ goal that during the implementation phase for the Goose Creek Subbasin and for other TMDLs that additional solar pathfinder data be collected on reference streams and rivers, such that a stratification of streams could occur. Currently we are limited to the data at hand and as more data is collected the percent shade targets will become more robust and we will be able to address the differences in widths more appropriately.

In reference to the last two sentences of the first paragraph on page 24:

There is only one threatened species (bald eagle), no endangered species, and only one candidate species (yellow-billed cuckoo), that need to be considered in any planning efforts and management decisions by the BLM Burley Field Office. This is in accordance with the most recent official species list (1-4-03-SP-283) received from the U. S. Fish and Wildlife Service on June 3, 2003.

This was incorporated into the document.

In reference to the species list and pollution tolerance levels from page 26:

On page 26, Table 9 lists fish species and pollution tolerance in the Goose Creek Subbasin. Fish species missing from the table include walleye and spottail shiner, which were introduced to Oakley Reservoir as a prey base for the game fishes. Fish included in the list but not likely found in the Goose Creek drainage include brown trout, kokanee salmon, and arctic grayling.

Walleye and spottail shiner were added to the table, while the reference to arctic grayling was removed.

In reference to the designation of all stream segments as coldwater fisheries, as on page 50:

DEQ provides a table of designated and existing beneficial uses for each stream segment in the Goose Creek watershed on page 50. All of the segments are listed COLD, presumably for cold water aquatic life, as described on page 38. However, page 38 also provides criteria for seasonal cold water aquatic life. Although there is no accompanying description of the biotic community that would be expected to inhabit this type of system, Steven P. Canton, in a proposal to modify Colorado's stream classification system (Canton 2003) describes the expected condition of "Aquatic life cool" streams:

> "These are the transition streams—the bridge between the cold and warm water streams and biota. While cold and warmwater biota may be present, these streams often have their own cool water fish and invertebrates. As might be expected, coolwater streams would have more fish than coldwater streams—perhaps 5-9 fish species at a site. These streams are often dominated by "rough fish" (e.g., suckers), with minnows and dace often occurring. Trout may be present, but may not be reproducing. Warmwater fish, like sunfish, may be found, but again may not be reproducing in these stream segments."

A designation similar to this would be more appropriate for some of the Goose Creek stream segments. Goose Creek from Beaverdam Creek to Lower Goose Creek Reservoir and Beaverdam Creek exhibit different characteristics than the headwater streams in this system. They are flatter, lower gradient, valley floor streams. They achieve warmer

temperatures due in part to their width and depth, and contain fish communities more reflective of coolwater systems.

Canton, Steven P. 2003. Proposed changes to Colorado's aquatic life classification system using findings of the arid west habitat characterization study. Arid West "Habitat Characterization Study" Symposium Proceedings. Februrary 24, 2003. Colorado Water Quality Control Division.

At this time, DEQ is not proposing to designate any stream within the state as seasonal cold water aquatic life. EPA has yet to approve those standards. Following approval by EPA, DEQ will collect the necessary information to make appropriate designations. Cool water or seasonal cold water aquatic life may be an appropriate designation for many streams throughout southern Idaho. However, the lower segments of Goose Creek have designated beneficial uses. These beneficial uses cannot be changed easily. A use attainability analysis would have to be completed in order to do so. The conditions of the use attainability analyses would not be met for the lower segments of Goose Creek. Therefore EPA would, likely not accept the analysis, and beneficial use designation change.

Beaverdam Creek is an undesignated water body. Default designations are cold water aquatic life and secondary contact recreation. Until designations are made the water quality standards for these designations need to be met on this system.

In reference to the hypothesis on page 82 dealing with the possibility that degradation in water quality over the past decade is the reason for a shift from cutthroat to rainbow trout:

It is BLM's opinion that this shift occurred before 1994. Fish sampling in 1994 yielded no cutthroat trout (only brook trout) and these fish were confined to one location (remainder of the creek was nearly dry). Further sampling by BLM in 1998 also revealed no cutthroat trout but did indicate that rainbow trout had entered the system and were populating the stream. The presence of one cutthroat trout in 1997 may indicate that a few cutthroat persisted in the system for several years while other species were colonizing. However it is probably an indication that these fish are present during some portion of the year in lower Goose Creek and attempt to populate cold creek. Due to the strong presence of rainbow and brook trout, this attempt will undoubtedly be precluded. It is BLM's opinion that cutthroat trout will not repopulate Cold Creek in the presence of rainbow and brook trout. Furthermore, the attached pictures are a good indication that conditions along cold creek have not deteriorated during the past decade but have improved substantially beginning in the early 1990's as is further substantiated in the Standards for Rangeland Health document which was finalized in 2000. Conditions, however, prior to the early 90's were quite degraded.


Lower Cold Creek 1983 (riparian area dominated by grass)


Lower Cold Creek 1998 (riparian area dominated by willow)


Lower Cold Creek 2001 (dominated by willow after only 2 years of recovery after fire)

DEQ postulated that the shift in fish community may have been the result of habitat degradation over the past decade. Photo documentation provided by the BLM refute this hypothesis. Other factors that could have caused this shift include competition between species and drought excluding cutthroat trout from Cold Creek or a synergistic effect of

the two. Currently DEQ is unable to determine the cause of the species shift, however; data provided by the BLM indicates that habitat alteration and water quality degradation over the past decade may not be the significant factor as presented in the document. As a result changes to this effect were made in the discussion.

In reference to the Cold Creek bacteria discussion on page 84:

It is highly unlikely that a few cattle occasionally loafing along cold creek above the lower monitoring site is causing the higher bacteria counts at this site. The upper site is located within the area where these livestock occasionally loaf as well and where livestock are periodically trailed but the counts are lower. Since these counts are not in exceedance of water quality standards, this discussion should not be included in the document as it seems mute.

Statistical tests were completed to determine if the differences between sites existed, for bacteria these differences were real (p = 0.033) see page 83. However, the hypothesized reasons for this difference were not empirically derived. DEQ may have overstated the continual presence of loafing cattle between the sites as a significant cause to the elevated bacteria. However, cattle were occasionally seen within the area. Changes to this effect were made to the document.

In reference to the temperature, shade and groundwater influence issues regarding Cold Creek on page 85 and 86:

There are several losing and gaining reaches along cold creek. The upper monitoring site is known to be losing reach since this location has gone dry in the past. This will greatly influence water temperature, particularly during drought cycles. There are a variety of other locations where data should be gathered when comparing the lower site to other portions of cold creek. Furthermore, the upper monitoring site is located within or very near where livestock are trailed along Goose Creek road. Due to this, measurements of solar input are probably atypical of much of the creek above this point where livestock are not trailed.
The implication that there may not have been any shading vegetation and that if it was present prior to the prescribed burn it needs to be restored is incorrect. Most of cold creek above the upper monitoring site has seen a dramatic increase in woody cover as is evidenced in the attached photos. The prescribed burn did temporarily remove much of this cover but as can also be seen in the photos, after only two years of recovery, woody canopy cover had already nearly recovered to pre-fire conditions.

Solar pathfinder data were collected over ten transects spaced approximately 500 meters apart. As a result, the average shade was derived from locations that span nearly a mile of Cold Creek. More extensive solar pathfinder data collections can be made during the implementation phase of the TMDL with the assistance of the land management agencies. Clarification of the monitoring protocol was added to the document.

In reference to the Bluehill Creek fishery discussion on page 90:

There are no known fish species present in bluehill creek in the upper reaches. The upper portions of the creek are mainly intermittent although there are perennial reaches. The only location that fish have ever been found is within approximately 1 mile of the mouth of the system where the most consistent higher flows occur in association with a spring area. This reach, during drought periods, also appears to suffer from a lack of sufficient flow to sustain a fishery.

DEQ has made changes to this effect in the document.

In reference to Table 28 on page 142:

It is unclear how these land uses are going to be used for allocation purposes. Depending upon how the percent forest and percent range will affect load allocation for BLM, we would appreciate the opportunity to refine the numbers in the table.

Gross load allocations were made based upon watershed only. It has yet to be determined how load allocations will be made on a finer resolution. The information provided in Table 28 is one allocation method available. Another method includes allocation based on land ownership. These decisions will be made during the implementation planning process. DEQ encourages BLM's participation in that process so that final allocations can be based on acceptable methods to all land management agencies

In reference to BLM's efforts to improve water quality on pages 162-164, BLM would like to add several other items:

The BLM portion of Little Cottonwood Creek, above what is considered a ditch, was fenced into a riparian pasture in 1999 in order to improve riparian area conditions. This applies to the first mile of stream immediately downstream from the USFS/BLM boundary.

The BLM portion of trapper creek above the high water mark in Oakley reservoir was fenced in 1989 to allow for riparian area improvement and recreational opportunities. Livestock are allowed to trail through the area.

The BLM manages approximately 1.7 miles of Goose Creek of which 1.2 miles has been excluded from livestock beginning in approximately 1987. One portion that has not been fenced lies directly below the USGS gauge and above the high water mark of Oakley reservoir. This segment was assessed in 2000 and was found to be in proper functioning condition. Livestock management here consists of two years of spring use followed by two years of fall use, which appears to be adequate for this system to function properly.

These and other past pollution control activities and efforts will be incorporated into the implementation plan. The implementation coordinator of the Twin Falls Regional Office of DEQ has been informed of the extensive hard copy list provided by the US BLM.

In reference to the discussion of potential vegetation along Goose Creek on page 167:

BLM encourages DEQ to visit the BLM portions of Goose Creek to examine what is capable of growing along the creek. Much of these portions of the creek are growing willow communities although it does appear that the finer substrate portions of the creek will take longer time frames for this to occur.

DEQ has used the term "potential vegetation" in this document to describe land use potential vegetation rather than ecological potential. The two are dissimilar in that the Goose Creek Subbasin has the ecological potential to contain large communities of willows while the land use potential is such that haying and farming practices have excluded these from the landscape. Use of the term has been clarified.

In reference to the statement in the middle of page 169 regarding the lowest flows for which water quality standards apply:

There needs to be more clarification about these lowest flows of 0.142 cubic meters/second (recreational uses) and 0.028 cubic meters/second (aquatic life). For instance, does this mean that measurements for bacteria or temperature should not be taken when flows are less than this or that TMDL's should not be set for streams which flow less than this? Are the minimum flows a yearly average?

These flows were the design flows upon which the load capacities were developed for Beaverdam Creek and Left Hand Fork Beaverdam Creek. The TMDL then sets the compliance targets and allocations for the watershed based upon this load capacity. Compliance would be based upon current flow and concentration taken during compliance monitoring. These streams are perennial water bodies. Consequently measurements of bacteria and temperature can occur at any flow level. Idaho's water quality standards contain flow criteria for intermittent water bodies and when the water quality standards apply. These, however; have not been approved by EPA and should be used cautiously on other systems.

In reference to the discussion of site potential shading at the bottom of page 173:

BLM strongly disagrees with the assumption that prescribed fire has changed the potential natural communities along streams in this subbasin. Fire is a natural part of these areas and generally does not kill the underground portions of most riparian species. Numerous natural fires (both pre and postsettlement) have occurred throughout the subbasins mentioned in this discussion and there is no indication that there is any difference between that response and the response after prescribed fire. Post fire response along Cold Creek following the 1999 fire illustrates this. Although the height of

riparian shrubs was temporarily reduced, no shifts in riparian potential occurred. Willows and other woody riparian vegetation has rebounded dramatically in the four years since the fire. Prescribed or natural fire should not be lumped with channel armoring, straightening and entrenchment in this discussion.

DEQ agrees with the US BLM that fire should not be included with other factors such as channel armoring, straightening, and entrenchment. Moreover, farming and ranching activities have had a longer-term effect on the vegetative ecology of the streams of Goose Creek than fire. Clarifications to this point were made due to previous comments about potential vegetation.

In reference to the discussion of bank stability monitoring on Goose Creek at the top of page 178 and in reference to the cold creek monitoring site at the bottom of this same page:

The low end of Goose Creek below the USGS gauge on BLM managed land (near the low monitoring site) is not a good place to monitor bank stability changes as this reach is atypical of the majority of the creek above this point. This BLM reach is quite rocky and was determined to be properly functioning with good bank stability already.

Bank stability monitoring occurred at several locations throughout the Goose Creek drainage. These included sites in Nevada, Utah, the unlisted portion of Goose Creek in Idaho, and several locations in the lower listed portion. The lower BLM reach was not included in this monitoring as it was atypical with the remainder of the system.

The Cold Creek monitoring site near Goose Creek road needs to be placed far enough above the road crossing so as to be representative of this reach. Immediately at and near the road crossing is a zone where livestock are allowed to trail up and down Goose Creek road which will likely influence the degree of shade which can be attained here. It would be desirable to locate other monitoring locations farther upstream in order to get a better handle on how drought is affecting the temperature in Cold Creek (the current monitoring site is at the low end of a losing reach which will warm rapidly during low flow periods such as have occurred beginning in 2000).

The compliance monitoring location can be adjusted to better reflect current conditions along the creek if it is determined that a more representative location is available. Discussion of compliance point locations will be made with the stakeholders and land management agencies during the implementation planning process.

In reference to DEQ's method for the creation of hydrographs and use of Rosgen regional curves:

We understand that it is not possible to collect flow data for each and every tributary for a system such as Goose Creek and that flows must be assumed to calculate a TMDL. However, we would like to stress the importance of understanding that many of these streams are extremely variable. Hydrographs were created by establishing a correlation

with a reference stream, such as Goose Creek or Trapper Creek, and adjusting the larger stream's hydrograph to correspond to a small number of points in a smaller stream or tributary. While it is reasonable to assume that the overall shape of these hydrographs is likely quite similar to that of the smaller streams, our confidence in their ability to predict average flows is very low. For example, page 169 gives the average discharge during the April 1-July 1 period as .019 m^3/s (6.7 cfs). BLM records indicate that for the period 1982-1987 flows in Cold Creek varied from 2.2 cfs to 107.2 cfs. Although we are also lacking comprehensive flow data, our field observations have also recorded portions of this creek dry in drought years (e.g., 1994). Our belief is that the use of DEQ's method may underestimate flows in the spring runoff period, and overestimates flows throughout the drier months of July and August.

DEQ also agrees that the average hydrographs do not reflect the actual variability seen within these systems. However, in many instances the shape of the curve and an indication of when critical periods with diminished flows occur is needed to complete the TMDL calculations. Rather than relying on incomplete data, a statistical approach was taken to determine these flows and time periods.

Regarding the use of Rosgen's regional curves, we agree with the statement on page 64 that the "arid Goose Creek Subbasin may not fit the regional curves developed by Rosgen" and would like to request that this statement be added to each stream reach.

DEQ agrees that this statement is appropriate for each of the listed and assessed water bodies within the Goose Creek Subbasin.

In reference to conflicts between macroinvertebrate data and fish data:

In cases in which macroinvertebrate collection data and fish data are in seeming conflict, such as in Trapper Creek (page 66), DEQ's conclusions regarding water quality are likely inappropriate. Macroinvertebrates tend to be fairly site-specific organisms, without movement over large distances compared to fishes. In cases like Trapper Creek, where macroinvertebrate indices are indicative of good water quality, the presence of some moderately intolerant fishes is not an indicator of impaired water quality. It is the absence of intolerant species, rather than the presence of moderately intolerant species that indicates water quality impairment. BLM strongly agrees with DEQ that the apparent lack of salmonid spawning in the lower segment is not necessarily due to impaired water quality (page 67). And DEQ's statement on the same page concerning competition with hatchery fish or fishing pressure is a highly probable explanation for the apparent lack of "wild fish".

DEQ agrees that if macroinvertebrates and fish community information was the only information relied upon in an assessment of Trapper Creek the outcome would be much different. However, other factors precluded that outcome such as nuisance aquatic vegetation, seasonally high sediment concentrations, and poor bank stability.

In reference to the "measured water quality constituents" tables for each stream:

Please highlight or bold the instances where there is an exceedance. This would make it much easier to track water quality violations.

DEQ agrees that this would make each table easier to read. However, the footnote requirements for doing so would make the tables more unwieldy an diminish the utility of making the change.

In reference to sediment TMDL's:

The lack of high flows throughout the past several years has led to an accumulation of sediment in many of the Goose Creek Basin streams. It may be important to note this in the first few years of the TMDL implementation as high flows are likely to wash out these stored sediments and may result in high sediments levels downstream.

DEQ agrees with this statement. It should also be noted that until bankfull flood events occur the predicted sediment loads from the bank stability assessments will not occur and that this sediment will be stored within the unstable banks and along the streambeds.

In reference to data limitations:

Understanding that DEQ has been limited as far as time and funding, we appreciate the opportunities that will be available in the future to further review and refine these TMDL's as more data becomes available.

The first opportunity to refine the TMDL will occur during the implementation phase. It is strongly encouraged that all interested parties and land management agencies participate in the implementation-planning phase of the TMDL. Following implementation planning the adaptive management loops provide for continued refinement of the TMDL as our knowledge and data within the systems increases.